National Park Service
Fire Ecology Annual Report
Alaska Region
Calendar Year 2013

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A. Summary

Overview

The NPS Alaska Region fire ecology program provides science-based information to guide Alaska NPS fire and land management planning, decisions and practices in order to maintain and understand fire-adapted ecosystems in Alaska. This annual report provides brief summaries about the NPS Alaska 2013 fire season, fire ecology monitoring results, fire research projects, and fire ecology program activities and outreach.

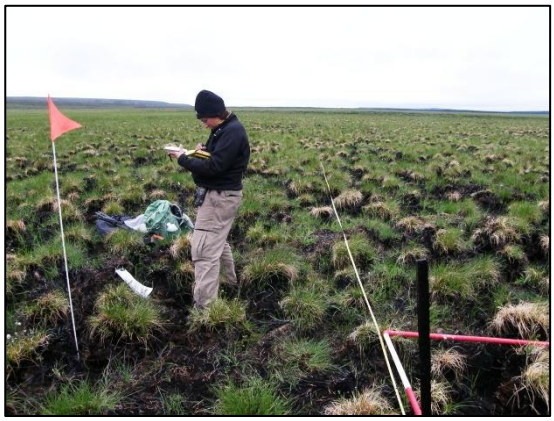

Figure 1. Monitoring a long term tundra fire plot, that burned again in 2012 in Noatak National Preserve. NPS photo 2013.

In 2013 the Alaska fire ecology program prepared monitoring reports, consulted on the Alaska NPS Regional Fuels EA, conducted a fuel moisture training workshop, prepared research proposals, and participated in several agency and interagency committees. During the field season, the fire ecology program re-measured tundra fire plots in Noatak (Fig. 1), conducted a burn severity assessment, and continued to collect seasonal fuel moisture samples. Communicating results and information about fire ecology continued to be a focus of the program.

The purpose of the Alaska NPS Fire Ecology program is to provide science based information to guide Alaska NPS fire and land management planning, decisions and practices in order to maintain and understand fire adapted ecosystems. The primary focus areas of the program are to:

- Participate in *planning* activities for the Fire Management and Park Land Management Programs and develop strategies to accommodate fire management issues as a result of climate change
- Provide effective evaluation of Alaska NPS fire management program activities and fire on the landscape through *monitoring*
- Coordinate *research* and facilitate the use of scientific data, modeling and technology to enhance the fire management program
- Provide fire ecology *information and outreach* to fire managers, other park staff, and the public
- *Collaborate* with other NPS programs, interagency partners, and other entities.

2013 Fire Season

What looked to be a slow fire season in the making, with snow on the ground well in to May, ended up being an average fire season for Alaska. A total of 612 fires were reported which burned 1,320,752 acres statewide for Alaska in 2013 (AICC Situation Report Nov. 1, 2013, http://fire.ak.blm.gov/). As the season varied from record high temperatures and low rainfall in June, to cool and wet weather in early July, and then back to warm temperatures - the fire season persisted well into August. Fires occurred throughout the state, although a majority of the large fires occurred in the southwest and interior of Alaska. Southwest Alaska (McGrath Area) had a busy June with two of the largest fires in the state (Lime Hill and Moore Cr) and numerous other fires.

Figure 2. Currant Cr Fire in Lake Clark NP on July 25, 2013. (NPS Photo/Buck Mangipane).

The fire season was active on National Park Service lands in Alaska. A total of 34 wildfires burned 158,689 acres within six Alaska park units (Table 1). Katmai NP started off the fire season in early May with a human caused spring grass fire that burned 240 acres. By early June there were fires in Lake Clark (Fig. 2), Denali and Wrangell-St. Elias. Denali which had several large fires had the greatest number of fires and most area burned of the parks in Alaska during 2013.

Table 1. Wildfires and prescribed fires in Alaska park units from 2013

Park Unit	Number of Wildfires	Total Acres Burned*	Acres within NPS Boundary	Number of Prescribed Fire Units	Acres of Prescribed Fires
Denali National Park & Preserve	14	207,086	104,850	3	10.1
Katmai National Park & Preserve	1	240	240	0	0
Lake Clark National Park & Preserve	2	18,615	14,783	0	0
Noatak National Preserve	7	546	546	0	0
Wrangell-St. Elias National Park & Preserve	8	46,642	37,331	5	17
Yukon-Charley Rivers National Preserve	2	11,338	938	0	0

* Includes total acres of all fires that were within or partially in the administrative boundaries of the park unit.

B. Monitoring & Inventory

Monitoring and inventories are utilized by the fire ecology program to provide feedback to the NPS fire management program on activities such as fuels treatments and to continue to gain a better understanding of wildfire effects on the landscape. Table 2 provides a list of the number of plots

measured in 2013 and the total number of fire/fuels monitoring or inventory plots established in Alaska parks since 2003.

During 2013 the NPS Alaska fire ecology program re-measured eight fire effects vegetation plots in Noatak NPr. In addition twenty-two burn severity plots were established in the 2012 Uvgoon Cr fire. Brief descriptions of the monitoring and burn severity assessment projects from Noatak are provided below. The results of a hazard fuels reduction project from Bering Land Bridge that was completed in 2012 are also presented below.

Table 2. Fire effects plot workload (2013) and total monitoring plots Installed 2003-2013

Park	Monitoring Unit	Type of Plot (FMH, photo point, other)	Pre-burn/TX 2013	Immed. Post 2013	Post (1-20 yrs) 2013	Annual Total	Total Plots
Wrangell-St. Elias	Carl Cr RX	AKR Carl Cr Plots					29
	Chakina Fire 2009	CBI & Cover					56
	Chakina Fire 2009	AKR Fire & Fuels Plots					9
	Susan Smith – Hazard Fuels Plots (HZF)	AKR SS Hazard Fuels Plots					13
	Headquarters – HZF	AKR Hazard Fuels Plots					19
	Fire Effects – Paired Plots	AKR Paired Plots					2
	McCarthy University Subdivision - HZF	AKR Hazard Fuels Plots					27
Yukon-Charley Rivers	2004 Woodchopper Fire	AKR Fire & Fuels Plots					7
	1999 Witch Fire	Fire effects - other					15
	2004 Fire – Paired Plots	AKR Paired Plots					5
Denali	Headquarters – HZF	AKR Hazard Fuels Plots					27
	VDM HighpowerReburns	AKR Fire & Fuels Plots					10
	Landcover-CBI	AKR Fire & Fuels Plots					55
Noatak	2010 Fires	CBI & Cover					34
	2004 Uvgoon Fire	AKR Fire & Fuels Plots			6	6	6
	2012 Uvgoon/ Kungiakrok Fires	CBI & Cover			22	22	22
	1977 Fires Racine Plots	Racine Plots			2	2	8
Bering Land Bridge	1977 Fire Racine Plots	Racine Plots					8
	Fairhaven Ditch Cabins- HZF	AKR Hazard Fuels Plots					4
Total					**30**	**30**	**355**

Noatak Burn Severity Monitoring

As fires burn under varying weather conditions across landscapes characterized by varying topography and fuel types, the fire behavior and effects can change. So, within any given fire, some areas may be radically changed due to intense scorching or sustained burning of surface organic layers, while other areas remain untouched. This heterogeneous pattern or 'fire mosaic' is the result of varying burn severity on the landscape.

Burn severity influences vegetation patterns, succession after fire, carbon emissions, and many other ecological factors after a fire. National programs such as the Monitoring Trends in Burn Severity (MTBS) program and USGS provide burn severity maps for large fires utilizing satellite imagery (http://www.mtbs.gov/) (Figure 3). As part of the fire monitoring program these maps are occasionally assessed with ground truth plots to calibrate the satellite based burn severity maps with field data. In 2013, twenty-two plots were measured for burn severity, vegetation composition, and organic soil consumption at the 2012 Uvgoon Cr #1 and Kungiakrok Cr fires which burned together for a total of 53,825 acres (based on perimeters from burn severity maps).

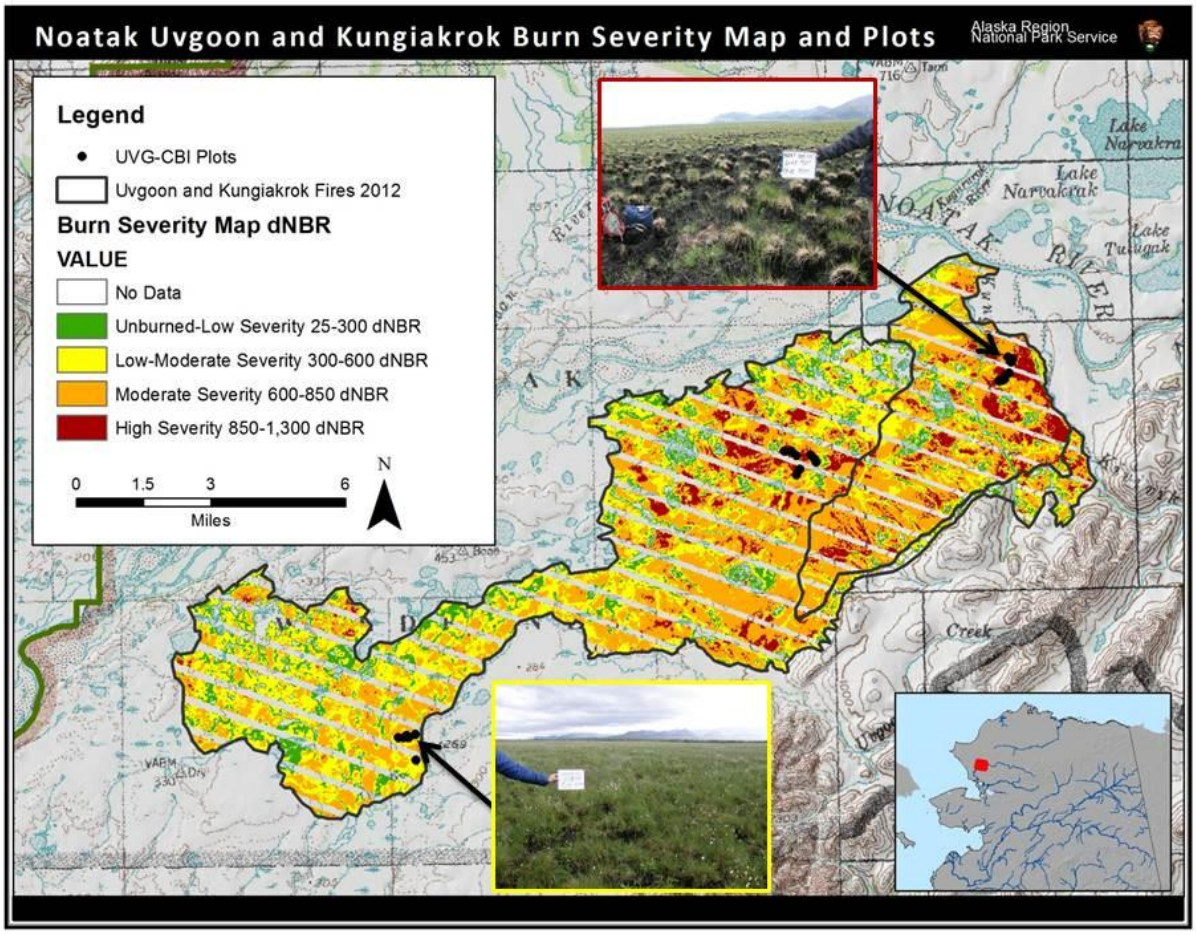

Figure 3. Satellite derived burn severity map of the 2012 Uvgoon Cr and Kungiakrok fires in Noatak National Preserve, Alaska. Ground truth plots (black circles) were used to assess the scale of burn severity. Note that the stripes in the map are caused by satellite issues.

Figure 4. Examples of different burn severities 1 year after the 2012 Uvgoon Cr and Kungiakrok tundra fires in Noatak National Preserve, Alaska. Left photo is low severity, middle moderate severity and right high severity based on CBI plots. (NPS Photos/AKR Fire Ecology).

Ground based burn severity was assessed using Composite Burn Index (CBI) plots. The fire effects were assessed for multiple vegetation strata and variables (ground, herbaceous, shrub and tree layers if present). Severity was scored from 0 to 3 for each stratum, where 0 was unburned or unaffected by fire and 3 represents high severity. Examples of different burn severities are shown in Figures 3 and 4.

Preliminary results of the burn severity assessment for these two tundra fires showed a relatively good relationship with the remote sensed burn severity map (r^2 = 0.638). The initial assessment burn severity map was produced immediately after the fire and appeared to have high values of delta Normalized Burn Ratio (dNBR) which would suggest high severity. Based on the plot data it is estimated that these high dNBR values (600-850) do not necessarily represent high severity, but are more likely moderate severity (see legend in Figure 3 and Figure 5). Based on the initial assessment maps and ground truth plots, a majority of the area had moderate or low burn severity within the fire areas.

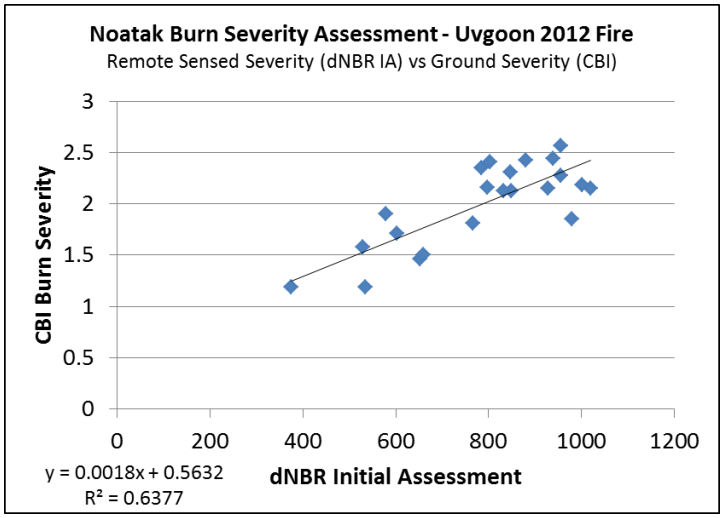

Figure 5. Comparison of remote sensed burn severity values (dNBR) to ground based burn severity measures (CBI) for the Uvgoon/Kungiakrok fires of 2012 in Noatak NPr, Alaska.

Noatak Tundra Fire Effects Monitoring

Eight fire effects vegetation plots were monitored in Noatak NPr in 2013. Six of the plots were from the 2004 Uvgoon Cr fire, in which 3 burn plots and 3 control ("unburned") plots were established immediately after the fire. Although a small data set, these monitoring plots suggests rapid re-vegetation can occur after low or moderate severity fires in shrub-tussock tundra sites. The photos in Figure 6 show that within a few weeks after the fire, the tussocks (*Eriophorum vaginatum*) were re-sprouting. One year after the fire at this site there was a flush of tussocks flowering and by 9 years post fire most of the vascular vegetation had regrown and was similar to the control plot that had not

Figure 6. Tundra fire monitoring site in Noatak shows rapid regrowth of vascular plants after a moderate severity burn at this site in 2004. (NPS Photos/AKR Fire Ecology).

burned recently. Shrubs such as Labrador tea, dwarf birch, low bush cranberries and blue berries increased in cover over time; by 2013 the average cover of shrubs was similar to unburned control plots. Although the vascular plants appear to recover quickly in tundra fires, the late successional mosses and lichens appear to have a slower re-establishment.

Two additional plots from a different study were monitored in 2013. The original plots were established by C. Racine in 1982 immediately after a small tundra fire occurred. The paired burned and unburned plots were burned in the 2012 Kungiakrok Fire. Understanding the impacts of shortened fire return intervals in both tundra and boreal forest ecosystems will be important in light of future climate warming.

Bering Land Bridge Fairhaven Ditch Cabins Fuels Reduction

In 2012 the NPS Alaska Western Area fire management crew conducted a vegetation fuels reduction project around two historic structures (Fairhaven Ditch Cabins 2 and 3) in Bering Land Bridge National Preserve. Vegetation around these cabins consisted mostly of tall willow, shrub birch, dwarf shrubs, and herbaceous plants (Fig. 7a). The goal of the fuels reduction was to reduce the tall shrubs around the cabins to better enable firefighters access to the site if the cabins needed protection from a wildfire. These cabins were built in approximately 1906 as part of the 38 mile Fairhaven Ditch which was constructed to provide water for gold mines along the Inmachuk River drainage (Frank, W. 1986 Historic Resource Study: Bering Land Bridge National Preserve https://archive.org/details/historicresource00will).

Figure 7a. Dense tall shrubs surrounded the historic Fairhaven Cabins in Bering Land Bridge NP prior to the fuels treatment, 2012 NPS Photo.

Figure 7b. The same plot immediately after the fuels thinning treatment, 2012 NPS photo.

The specific fuels reduction objectives were to cut tall shrubs out to 50 ft from the cabins and to remove 80% of the tall shrub cover. Pre-treatment monitoring data was collected just prior to the fuels treatment and re-measured immediately post treatment in mid-June of 2012. Four 16-m transects were established to document shrub reduction in the treatment area to evaluate the success of the hazard fuels treatment in meeting prescription objectives.

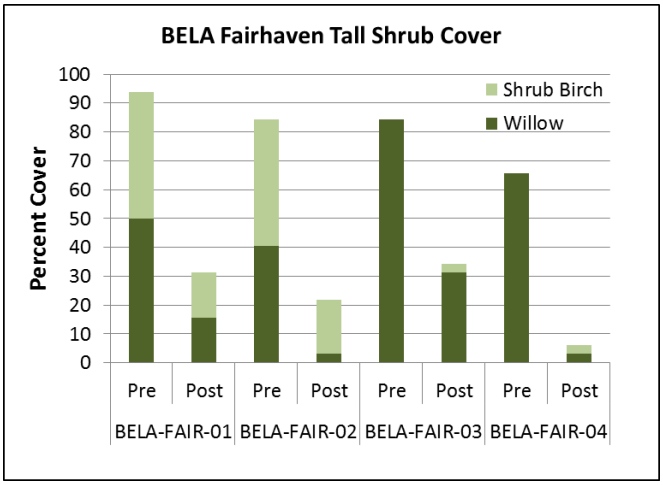

Figure 8. Percent cover of willows (Salix pulcra and S. glauca) and shrub birch (Betula glandulosa) for each transect before and after the fuels reduction project at the Fairhaven Cabins in Bering Land Bridge NP.

Based on the 2012 monitoring plots, the prescribed reduction of tall shrub cover was nearly met with a 66% reduction in tall shrub cover. Two of the monitoring transects (Fair-01 and Fair-03) extended beyond the cleared area (Fig. 8), therefore the shrub reduction percentage was actually higher within the cleared area. The dominant tall shrubs (birch and willow) were reduced from 78.1% (69.3 - 87.0% CI) to 26.6% (13.6-39.5% CI) cover after the fuels reduction project. Management objective results are presented in Table 3.

The project area was within the burn perimeter of a large 1977 fire (Kugruk Hi Fire). Fire evidence was detected adjacent to the cabin sites, with evidence of a small spot fire that likely crept within a few feet of one of the cabins. Clearing the brush and opening the area around these historic structures will benefit future structure protection efforts in the event of a wildfire.

Table 3. Management Objectives and Monitoring Results. All results shown are 80% confidence intervals of the mean. Fuel reduction objectives/results are mean percent reduction from pre-treatment to immediate post-treatment. An underlined number of plots indicate that the minimum sample size has been attained for that variable.

Monitoring Unit	Management Objective	Monitoring Results (80% Confidence Interval)	Objective Achieved?	Year Last Analysis Completed & Years included in analysis
BELA Fairhaven Ditch Cabin – Hazard Fuels	80% of tall shrubs will be removed	**Percent Shrub Cover** *Pre-treatment (n=4 plots):* 78.1% (69.3 - 87.0%) cover *Post-treatment (n=4 plots):* 26.6% (13.6-39.5%) cover Percent removed: 65.9%	**Yes,** see results discussion.	2013 (2012)

Data Management

Data for all recent monitoring projects have been entered into FFI (FEAT/FIREMON Integrated) - a plot-level monitoring sequel server software tool designed to assist managers with collection, storage and analysis of ecological information (http://www.frames.gov/partner-sites/ffi/ffi-home/). Digital archives and metadata for the AK databases were uploaded to the NPS datastore IRMA in Feb 2013

(Alaska Eastern Area fire ecology data set: https://irma.nps.gov/App/Reference/Profile/2193461 and Alaska Western Area fire ecology data set: https://irma.nps.gov/App/Reference/Profile/2193440) The updated databases will be archived in Feb 2014 with recent data additions and QC to the AK NPS fire ecology databases (Table 4).

Table 4. Monitoring Data Entry and Number of Treatment Units Monitored for 2013

Park	% 2013 Data Entered	% 2013 Data Quality Checked	# Prescribed Fires Monitored	# Non-fire Fuels Treatments Monitored	# Wildfires Monitored	# BAER Treatments Monitored
Noatak CBI and Fire Plots	100%	90%	0	0	2	0
Bering Land Bridge 2012	100%	90%	0	1	0	0

C. Research & Technology

The AKR fire ecology program coordinates ***research*** and facilitates the use of scientific data, modeling and technology to address the needs of the fire management program. This year five fire research proposals were submitted to various funding organizations (see Table 5). A study on past fire history (last 300 years) and interactions with climate for Denali was selected for funding under the NPS PMIS regional block grants that will begin in 2016. Below are descriptions of research and technology projects worked on in 2013.

Table 5. Research workload in 2013

Park	Are research needs identified in FMP or Monitoring Plan? (yes or no)	# of Proposals Submitted in 2013	# of Proposals Funded in 2013	# of Research Projects Supported in 2013*	Additional Comments
Noatak National Preserve	yes	0	0	1	NPS FY11 Reserve Fund Research
Wrangell-St. Elias NPPr and Lake Clark NPPr	yes	1	0	0	NSF Proposal for spruce bark beetle/fire risk
Denali NPPr	Under revision	2	1	0	PMIS – one proposal funded for FY16
Denali, Gates of the Arctic, Yukon-Charley Rivers	NA	1	0	0	JFSP proposal on fire behavior in recent burns

***Number of funded research projects, new or ongoing, supported by the fire ecology program including logistical info or support, staffing, etc.

Alaska Fuel Moisture Research

The amount of moisture in various types of vegetation can help fire managers determine if a fire is likely to start and how it might behave once ignited. Fuel moisture strongly influences fire ignition potential and flammability. Beginning in 2012, fire ecologists from the National Park Service, Bureau of Land Management Alaska Fire Service and US Fish & Wildlife Service coordinated a large effort to monitor fuel moisture trends throughout AK. A second Fuel Moisture Sampling

Figure 9. Top: Interagency fuel moisture workshop in Alaska 2013 (BLM-AFS Photo/Marcy Ugstad). Bottom: NPS fire staff sample spruce foliar moisture in Fairbanks (NPS Photo/Yasunori Matsui)

workshop was held in the spring of 2013 to train people on sampling foliar (conifer), woody (shrubs), herbaceous, and duff moisture (Figure 9). The AK NPS Fire Ecology Program established sampling sites in Denali National Park and Preserve and in Fairbanks, AK (Figure 9). The data for all the sites in Alaska have been entered in the National Fuel Moisture Database. This information has been used for fire behavior modeling and to compare duff moisture to the Canadian Forest Fire Danger Rating System (CFFDRS) fire danger indices.

Fire Research & Fire Modeling Committees

Both fire ecologists are part of the interagency Fire Research, Development and Application Committee (FRDAC) for the Alaska Wildland Fire Coordinating Group (AWFCG). The main goal of this committee is to identify agency fire research needs in Alaska and to encourage fire research to meet those needs. Every 2-3 years a new list is developed or updated. The latest interagency fire research needs list is provided on the Alaska Fire Science Consortium web page: (http://www.frames.gov/afsc/frdac).

The AKR regional fire ecologist and regional fire GIS specialist participate with the interagency AWFCG Fire Modeling and Analysis Committee (FMAC). With the help of the Alaska Fire Science Consortium, the Fire Modeling committee has updated a web page that provides many useful resources for fire behavior and modeling in Alaska (http://www.frames.gov/partner-sites/afsc/partner-groups/fire-behavior-modeling-group/). Both committees work closely with the Joint Fire Science Program-Alaska Fire Science Consortium (AFSC) and both fire ecologists participated in AFSC board meetings throughout the year.

D. Communicating Results

Communicating results of projects or research is an important aspect the fire ecology program in order to provide ***information and outreach*** to fire managers, park staff, and the public. Table 6 lists the number of monitoring reports and presentations completed by park. Communication comes in many forms: presentations, web pages, reports; but also includes blogs, facebook, and personal communication. All are important ways to communicate.

In 2013, a final report on a Wrangell St. Elias hazardous fuels project was published under the NPS Natural Resource Data Series - Monitoring hazardous fuel reduction in Wrangell-St. Elias National Park & Preserve: Lessons learned from the Chokosna Fuels Reduction Project. Two fire stories and other informal articles were written this year, including short articles on the age of carbon burned in tundra fires featured in the NPS RX Effects and Alaska NPS High Latitude Highlights newsletters. Seven or more presentations were prepared and presented this year by the regional fire ecologist,

ranging from "Impacts of Shortened Fire Return Intervals on Vegetation and Wildlife Habitat" to "Fire Behavior Modeling in Tundra". See Appendix A for a list of reports, presentations, and other forms of communication completed in 2013.

Table 6. Communicating Results - 2013

Park	# of Project Monitoring Reports completed in 2013	# of Annual meeting(s) with Park staff	# of Formal presentations of results	Do you use Minitab?*
Wrangell-St Elias	1	0	1	No
Yukon-Charley Rivers	0	0	1	No
Denali	1 draft	1	2	No
Noatak	0	1	1	No
Bering Land Bridge	1 draft	0	0	No

*****This information will help to assess Minitab multi-user license needs.

E. Planning and Compliance

The fire ecology program participates in ***planning*** activities for the Fire Management and Park Land Management Programs. Over the past several years the fire ecologists have reviewed and prepared sections of Fire Management Plans, written Fire Monitoring Plans, reviewed Environmental Assessments, and participated in Climate Change Scenario Planning for the region. Planning work in 2013 included preparing sections and reviewing the NPS Alaska Regional Fuels Environmental Assessment, compliance for field projects, and writing the Arctic Network I&M Fire Monitoring protocols. The Denali Fire Management Plan is under revision and the Gates of the Arctic Fire Management Plan is under review. During 2013, minimal time was spent on any fire management plans by the fire ecology program.

Table 7. Fire Management Plan - Fire Monitoring Plan Status as of 2013

Park	Does Park have written Desired Future Conditions (DFC)? (yes or no)	Date Park-level Monitoring Plan completed (or revised)	Total # of Project- or Community-level Monitoring Plans (not just 2013)	Assisted with how many BAER plans in 2013?
Denali	Yes in RSS	2013 in development	4	0
Gates of the Arctic	Yes - draft in GMP and FMP	2012 under review	1	0
Katmai	Yes – Suggested Fire Desired Conditions in FMP	2012	0	0
Lake Clark	No - Fire Management Objectives in FMP	2010	0	0
Western Arctic National Parklands	Yes - Interim Fire Desired Conditions in FMP	2012	4	0
Wrangell-St. Elias	No - Fire Management Objectives in FMP	2010	5	0
Yukon-Charley Rivers	No - Fire Management Objectives in FMP	2010	2	0

F. Fire ecology accomplishments and areas of focus

Fire Ecology Staffing 2013

The Alaska NPS Fire Ecology Program does not have a designated fire effects monitoring crew. Therefore, fire ecology monitoring fieldwork has largely been accomplished by NPS Fire/Fuels seasonal technicians under the guidance of the Regional Fire Ecologist and Assistant Regional Fire Ecologist. Over the past ten years this has worked well, since the NPS Alaska Western Area (AWAFM) and Eastern Area Fire Management (EAFM) programs have generally hired multi-disciplinary fuels seasonal staff and allocated some of their time to fire ecology projects.

In 2013, a new assistant regional fire ecologist, Jennifer Northway, was hired and started in late January. The re-hiring of this position has greatly benefited the fire program. During the winter/spring she focused on inputting and cleaning up the FFI database for data collected in the past and current projects, her GIS and Trimble GPS skills greatly benefited the compliance and implementation of field projects, and she assisted the area programs with prescribed fire pile burns and mapping active fires. Additional pay periods were added to her furloughed position through funding from the Arctic Network I&M program for monitoring fires in Noatak and participating with the interagency fire management teams on a few fire assignments.

Regional Fire Ecologists Accomplishment/Focus Areas

The Alaska regional fire ecologist facilitates planning, monitoring, research and outreach for the *region* and *park* programs. This position is responsible for monitoring plans, protocol development, compliance, administration, field instruction, field work, data analysis, and reporting on projects for the parks and region.

Assistant Fire Ecologist Accomplishments/Focus Areas

The subject-to-furlough assistant regional fire ecologist works for the regional fire ecologist in Alaska. This position helps plan and implement fire effects and fuels monitoring projects. This position also assists in the development of park fire management plans, fire monitoring plans, and compliance for fire ecology activities. A majority of work this year focused on inputting and cleaning up the FFI database for data collected in the past and current projects, implementing field projects, and assisting with prescribed fire pile burns. Due to lack of funding for some field projects and to provide support to the NPS and interagency fire community, some time was spent on wildfire assignments and assisting with fire mapping.

G. 2014 Fire Ecology Program Direction

The major focus areas for 2014 will be to complete the Arctic Network I&M fire protocols, complete monitoring reports for two hazardous fuels projects, and update fire monitoring plans for 2 parks. The Arctic Network Protocols for the Fire Extent, Severity and Effects vital sign are past due and need to be completed this year. Considerable time will be required to prepare these protocols by the Regional Fire Ecologist. Fire Management Plans and Fire Monitoring Plans will be prepared/revised for Denali and Gates of the Arctic. Depending on funding, field work will be focused on a

fuels/vegetation map update project in Yukon-Charley and 1 year post fire monitoring in Lake Clark and Denali. See lists below for the proposed direction of the AKR fire ecology program for 2014.

Planning

- DENA Fire Monitoring Plan/FMP Review
- GAAR Fire Monitoring Plan completed (update with links to Fire-Fuels Protocols)
- ARCN Fire Protocols
- Compliance for field work

Monitoring Field Projects and Data Entry

- LACL 2013 Fires burn severity assessments
- DENA 2013 Fires burn severity assessments of burned I&M vegetation mini-grid plots
- YUCH LC-CBI plots – 15 years post fire for landcover map updates
- Fuel moisture monitoring – DENA and Fairbanks

Reports/Outreach

- Report: DENA HZF Monitoring – FINAL
- Report: DENA fire effects
- Report: NOAT tundra fire effects – carbon study and burn severity
- Report: WRST Headquarters and McCarthy Subdivision HZF

Appendix A. Reports, publications, and presentations completed in 2013 in conjunction with the Alaska Region Fire Ecology Program.

Barnes, J.L. 2013. Does burn severity effect the age of soil carbon released during a tundra fire? A case study from Noatak National Preserve. RxEffects, NPS Fire Ecology Program. Vol 1, Issue 12, pg. 8.

Barnes, J.L. 2013. Alaska fire management & monitoring: Vast Areas, Large Fires and Limited Staff. (Presentation). RX-510, Applied Fire Effects. Tucson, AZ, February 2013.

Barnes, J.L. 2013. FSPro and Short Term Fire Behavior Modeling in Tundra: Information, decisions and reality. (Presentation-Webinar). Alaska Fire Science Consortium WFDSS Refresher Webinar, Fairbanks, AK, April 2013. http://www.frames.gov/partner-sites/afsc/events/previous-events/previous-webinars/wfdss-refresher/ (accessed 21 January 2014).

Barnes, J.L. 2013. Impacts of Shortened Fire Return Intervals on Vegetation and Wildlife Habitat (Presentation). Alaska Wildlife Society Conference, Fairbanks, AK, April 2013.

Barnes, J.L. 2013. Fire in Alaska Ecosystems (Presentation). Denali Interpretation Staff and Bus Driver Resources Day. Denali Park, AK, May 2013. (3 separate presentations)

Barnes, J.L. and Miller, E. 2013. Introduction to Fuel Moisture Sampling in Alaska. (Workshop). Interagency Alaska Fuel Moisture Workshop. Fort Wainwright, AK, May 2013. http://www.frames.gov/partner-sites/afsc/events/previous-events/workshops/2013-fuel-moisture-sampling-workshop/ (accessed 21 January 2014).

Barnes, J.L. 2013. Vital sign: Fire Extent, Severity, and Effects. (Presentation). ARCN Technical Committee Meeting. Fairbanks, AK, October 2013.

McMillan, J.M., and J.L. Barnes. 2013. Monitoring hazardous fuel reduction in Wrangell-St. Elias National Park & Preseve: Lessons learned from the Chokosna Fuels Reduction Project. Natural Resource Data Series NPS/AKRO/NRDS—2013/484. National Park Service, Fort Collins, Colorado. https://irma.nps.gov/App/Reference/Profile/2194705 (accessed 21 January 2014).

Fire Ecology Related Fire Stories & Other Communications:

What happens after a tundra fire? Fire Story: http://www.nps.gov/fire/wildland-fire/connect/fire-stories/2013-parks/noatak-national-preserve.cfm

Fire on the Tundra; Western Arctic Parklands KOVA Running Heard Blog: http://www.nps.gov/kova/blogs/Fire-on-the-Tundra.htm

Tundra and forest ecosystems revived by wildfires; Radio interview and fire effects photos on web page: http://kdlg.org/post/tundra-and-forest-ecosystems-revived-wildfires